

First report of *Nematopaguroides* (Crustacea: Decapoda: Paguridae) in the Indo-Pacific, and the description of a new species

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Abstract.—A new species of the hermit crab genus *Nematopaguroides* Forest & de Saint Laurent, *N. reconditus*, has recently been recognized from the South China Sea. This is the first record of the genus outside the subtropical western Atlantic Ocean.

The genus *Nematopaguroides* was proposed by Forest & de Saint Laurent (1968) for *Nematopaguroides fagei* Forest & de Saint Laurent, 1968, and distinguished from *Nematopagurus* A. Milne-Edwards & Bouvier, 1892, by the presence, in males of *Nematopaguroides fagei*, of an externally directed, filamentous right sexual tube, possible absence of a similar extension of the vas deferens from the left, and the absence, in females, of paired and modified first pleopods. A second species, *Nematopaguroides? pusillus* Forest & de Saint Laurent, 1968, was tentatively assigned to the genus based upon a single male specimen in which both right and left sexual tubes were well developed. Both species were collected during the exploratory voyage of the “Calypso” to the east coast of South America in 1961–1962. Although these species have been reported in Brazilian carcinological literature (e.g., Coêlho & Ramos 1972, Coêlho & Santos 1980, Coêlho & Ramos-Porto 1987, 1995; Rieger 1998, Melo 1999), most if not all citations are based upon the original descriptions of Forest & de Saint Laurent (1968). The only additional record of the genus was that of specimens attributed to *Nematopaguroides* cf. *pusillus* by Reed et al. (1982) from off the east coast of Florida.

Extensive surveys in the Hainan Island

region of the South China Sea, conducted by Chinese research vessels (R/V) during the National Comprehensive Oceanographic Survey (NCOS) of 1958–1960 resulted in the collection of a wealth of hermit crabs that are only now being studied. We are already aware of several new records for China that will be reported upon in subsequent publications. However, the discovery of a new species of the genus *Nematopaguroides* warrants particular attention. This is the first report of this genus in the western Pacific. Additionally, the development of a left sexual tube in males of *Nematopaguroides reconditus*, new species, represents an intermediate condition between *N. fagei* and *N. pusillus*, and confirms the accuracy of the assignment of the latter species to *Nematopaguroides*. The holotype and majority of paratypes of the new species are deposited in the Institute of Oceanology, Chinese Academy of Sciences, Qingdao (IOCAS). A pair of paratypes has been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). An indication of specimen size is given by the shield length (sl) measured from the midpoint of the rostral lobe to the midpoint of the posterior margin of the shield; the abbreviation ovig. refers to the ovigerous condition of some females.

Nematopaguroides Forest & de Saint
Laurent, 1968

Nematopaguroides Forest & de Saint Laurent, 1968:156.

Type species.—*Nematopaguroides fagei* Forest & de Saint Laurent, 1968; gender masculine.

Diagnosis.—Eleven pairs of biserial, phyllobranchiate gills. Rostrum broadly rounded. Maxillule with external endopodal lobe obsolete. Ischium of third maxilliped with well developed crista dentata and 1 accessory tooth; sternite of third maxillipeds unarmed. Chelipeds subequal or somewhat unequal. Males with symmetrical coxae of fifth pereopods, elongate right sexual tube directed obliquely toward exterior and with terminal filament; left coxa with or without sexual tube developed; 3 unpaired, unequally biramous left pleopods (3–5). Females with paired gonopores; no paired, modified first pleopods; unpaired left pleopods 2–5. Telson with prominent lateral indentations dividing anterior and posterior lobes equally or unequally; terminal margin with distinct median cleft.

Remarks.—Forest & de Saint Laurent (1968) remarked on the superficial similarity between species of *Nematopaguroides* and *Nematopagurus*, and that similarity is certainly apparent in *N. reconditus*, new species, as well. The new species differs from both Atlantic members of the genus in being an appreciably larger species, occurring at distinctly greater depths, and morphologically having noticeably more pronounced dilation of the corneas, more distinctly ovate ocular acicles, a roundly rectangular anterior lobe of the sternite of the third pereopods, and telsonal lateral margins provided with several short stiff setae.

The paucity of specimens of the Western Atlantic species of the genus precluded description of the mouthparts of *Nematopaguroides* by Forest & de Saint Laurent (1968). The mouthparts of *N. reconditus*, new species, are described herein.

Nematopaguroides reconditus, new species
Figs. 1, 2

Holotype.—S.E. off Hainan Is., South China Sea, R/V No. 171, Stn. 6144, 18°30'N, 111°00'E, 148 m, soft mud substrate, 22 Apr 1959, ♂ sl = 4.2 mm, IO-CAS L62B.

Paratypes.—S.E. off Hainan Is., South China Sea: R/V No. 121, Stn. 6122, 10°00'N, 111°30'E, 145 m, sandy mud substrate, 19 Oct 1959, 1 ♂ sl = 3.0 mm, 2 ♀ sl = 2.8, 3.3 mm, IOCAS N91B-31; R/V No. 101, Stn. 6123, 18°30'N, 111°30'E, 220 m, muddy sand substrate, 2 Aug 1960, 1 ♀ sl = 2.6 mm, IOCAS N115B; R/V 101, Stn. 6145, 18°15'N, 111°00'E, 173 m, soft mud substrate, 4 Aug 1960, 1 ovig. ♀ sl = 3.9 mm, IOCAS N173B-25; R/V No. 101, Stn. 6162, 18°00'N, 110°30'E, 145 m, mud substrate, 5 May 1960, 1 ♂ sl = 3.9 mm, 1 ♀ sl = 2.3 mm, 1 ovig. ♀ sl = 3.2 mm, IOCAS N198B-8; R/V No. 101, Stn. 6189, 17°00'N, 109°30'E, S, 162 m, coarse sand with mud substrate, 13 May 1960, 2 ♂ sl = 3.1, 4.4 mm, 1 ovig. ♀ sl = 3.5 mm, IOCAS N205B-48, 1 ♂ sl = 2.9 mm, 1 ovig. ♀ sl = 3.1 mm, USNM 253650.

Description.—Shield (Fig. 1A) slightly longer than broad to considerably broader than long; anterior margin between rostral lobe and lateral projections concave; anterolateral margins sloping or weakly terraced; posterior margin roundly truncate; dorsal surface with longitudinal row of sparse tufts of short stiff setae on either side, laterad of midline, few sparse tufts of short setae on or near each lateral margin, 2 sparse tufts of very short setae adjacent to rostral margin. Rostrum very broadly rounded, not produced beyond level of lateral projections. Anterior carapace often distinctly produced anteromesially of lateral projections and conspicuous in dorsal view. Lateral projections subtriangular, with or without laterally directed spinule.

Ocular peduncles short but 0.75–0.85 length of shield; dorsal surfaces each with 2 median sparse tufts of short stiff setae;

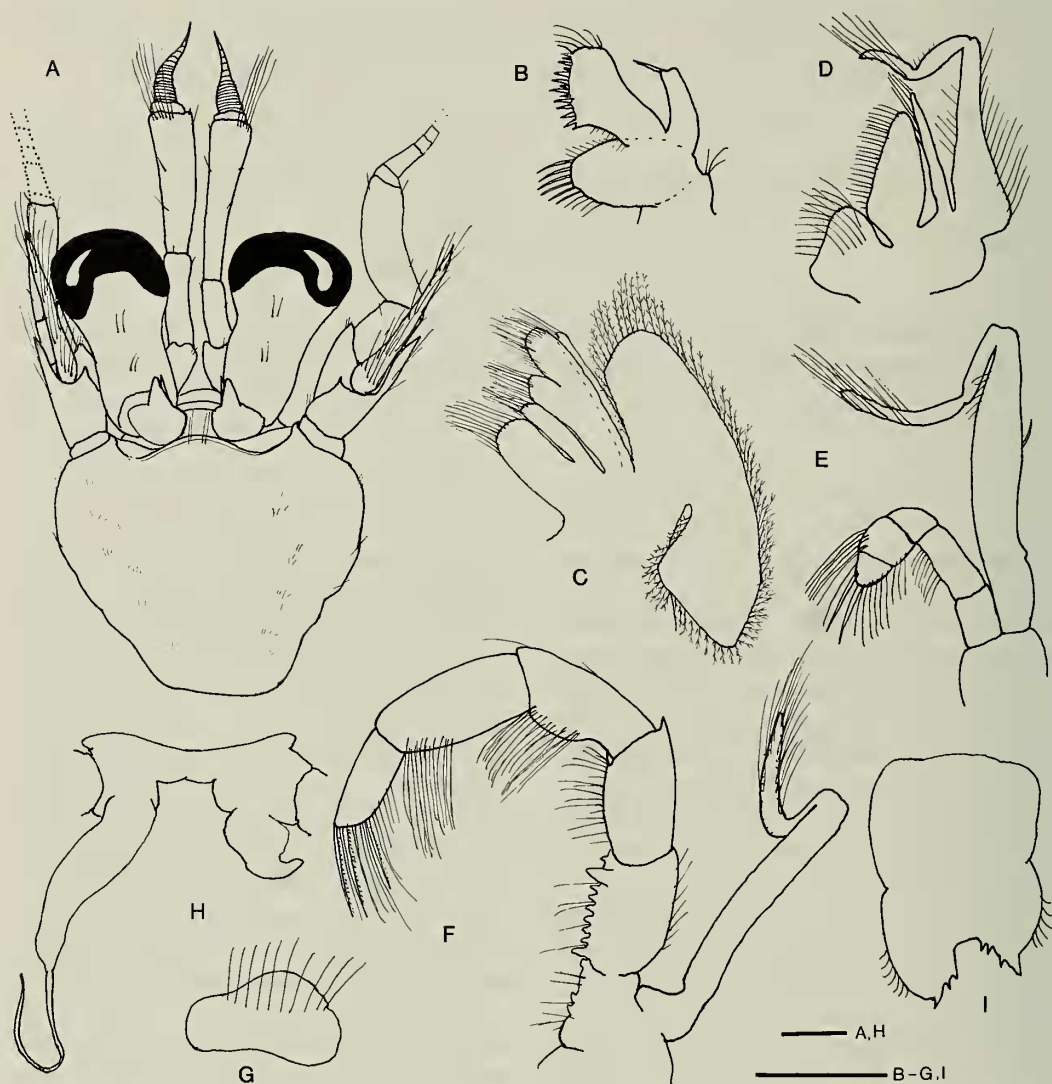


Fig. 1. *Nematopaguroides reconditus*, new species. A, G, H, male holotype, IOCAS L62B; B-F, female paratype from Stn. 6189, IOCAS N205B; I, male paratype from Stn. 6162: A, shield and cephalic appendages (aesthetascs not illustrated); B, maxillule (left, external view); C, maxilla (left, external view); D, first maxilliped (left, external view); E, second maxilliped (left, external view); F, third maxilliped (left, external view); G, anterior lobe of sternite of third pereopods; H, sternite and coxae of male fifth pereopods; I, telson. Scales equal 1 mm.

corneas strongly dilated, corneal diameter 0.65-1.0 of peduncular length, occasionally exceeding peduncular length. Ocular acicles small, ovately triangular, with deeply concave dorsal surface; terminating subacutely and prominent submarginal spine.

Antennular peduncles moderately long, exceeding distal margins of corneas by

nearly entire length of ultimate segments. Ultimate segment with 1 or 2 setae on distal margin laterally, subdistal transverse row of 5 or 6 very long setae, and few additional short setae scattered on surfaces. Penultimate and basal segments each with few scattered setae.

Antennal peduncles, overreaching distal

margins of corneas by 0.10–0.50 length of fifth segments. Fifth and fourth segments with few scattered setae. Third segment usually with small spine and sparse tuft of moderately long setae at ventrodistal angle, occasionally without spine. Second segment with dorsolateral distal angle produced into moderately long spine-like process, usually reaching to mid-length of fourth peduncular segment; dorsomesial distal angle with small spine; lateral and mesial margins with few stiff setae. First segment with spinule on ventrodistal margin. Antennal acicle moderately long, reaching to mid-length of ultimate peduncular segment; arcuate, terminating in acute spine; mesial margin with tufts of long stiff setae. Antennal flagella long, overreaching tip of right cheliped; 2 or 3 moderately short to moderately long setae every 6–10 articles in distal half, more closely-spaced proximally.

Mandible with 3-segmented palp. Maxillule (Fig. 1B) with internal lobe of endopod weakly produced, 1 terminal seta; external lobe obsolete. Maxilla (Fig. 1C) with endopod slender, slightly shorter than distal lobe of basal endite, but overreaching distal margin of scaphognathite. First maxilliped (Fig. 1D) with slender endopod and very slender proximal segment of exopod. Second maxilliped (Fig. 1E) without distinguishing characters. Third maxilliped (Fig. 1F) with 2 or 3 spines on basis; ischium with well developed crista dentata and 1 accessory tooth; merus with prominent dorsodistal spine. Sternite of third maxillipeds unarmed and without noticeable median notch.

Chelipeds subequal; right stouter, but not necessarily longer than left, both moderately to appreciably elongate. Right cheliped (Figs. 2A, B) with dactyl 0.70–1.10 length of palm; cutting edge with 2 widely-spaced, strong calcareous teeth in proximal 0.75, small corneous teeth distally, terminating in small corneous claw and slightly overlapped by fixed finger, dorsal surface with transverse rows of sparse tufts of setae mesially and extending onto rounded dor-

somesial margin, marginal longitudinal row of longer stiff setae extending nearly to tip, few tufts of short setae adjacent to cutting edge. Palm slightly shorter to approximately equaling length of carpus; dorsomesial margin with row of quite small spinulose tubercles, mesial face dorsally with 1 or 2 rows of sparse tufts of long stiff setae; dorsal surface with 9–12 irregular and interrupted transverse rows of stiff setae and occasionally short longitudinal row of 3 or 4 spinules in midline proximally, fewer and more widely-spaced transverse rows of setae on fixed finger, dorsolateral margin with few low tuberculate projections or small spines proximally; sometimes margin elevated to form very low ridge and lined with long stiff setae; lateral and ventral surfaces each with short transverse rows of long stiff setae, fewer in number ventrally; cutting edge of fixed finger with 1 small and 1 large elongate calcareous tooth proximally, row of small calcareous teeth in distal half interspersed with minute corneous teeth, terminating in small calcareous claw; row of tufts of short setae on adjacent dorsal surface. Carpus approximately equal to length of merus; dorsodistal margin with 1 spine mesially and row of stiff setae; dorsomesial margin with row of spines, at least in distal half and each spine usually accompanied by short setiferous ridge, dorsal surface with numerous low, setiferous ridges, dorsolateral margin not distinctly delimited, but with somewhat irregular row small spines, most accompanied by setiferous ridges; lateral and mesial faces each with numerous short transverse or vertical rows of long stiff setae, sometimes capsulate on lateral face; ventral surface with few low ridges and long setae, ventrolateral distal angle with 1 or pair of subacute spines. Merus subtriangular, dorsal margin with irregular row of short transverse scute-like ridges extending onto mesial and lateral faces and accompanied by long setae; ventrolateral margin with row of low transverse ridges and long stiff setae, 2 or 3 moderate to widely-separated spines in distal half; ven-

tromesial margin and ventral surface also with transverse ridges and long stiff setae, ventromesial distal angle usually with small spine, ridges of ventral surface sometimes accompanied by small subacute spines. Ischium with 2 or 3 short transverse ridges and long setae on ventromesial margin. Coxa occasionally with small acute spine at ventromesial distal angle.

Left cheliped (Fig. 2C) reaching nearly to tip of dactyl of right, sometimes beyond; moderately slender. Dactyl 1.5 to approximately twice length of palm; cutting edge with row of small corneous teeth, terminating in small corneous claw and slightly overlapped by fixed finger, surfaces and margins unarmed but with setation as in right. Palm slightly more than half length of carpus; dorsomesial margin with few small blunt or spinulose tubercles, occasionally small spines proximally, decreasing in size and becoming obsolete or appearing only as tiny granules distally; dorsal surface, like that of right, with short irregular and interrupted transverse rows of long stiff setae, occasionally with short longitudinal row of 3–5 small spines on proximal midline, setation of other surfaces also like that of right; dorsolateral margin with slightly elevated, occasionally spinulose ridge lined with long setae; cutting edge with row of widely-spaced, small calcareous teeth interspersed with very small corneous teeth. Carpus approximately equal to length of merus; dorsodistal margin with 1 small spine mesially and often second smaller spine laterally, dorsomesial and dorsolateral margins each with row of spines accompanied by transverse ridges of long setae, spines of dorsomesial margin more prominent and often somewhat hooked, dorsal surface with short transverse setiferous ridges; lateral, mesial, and ventral surface with setation as on right. Merus with setation also as on right; ventromesial and ventrolateral distal angles each with moderately prominent spine. Ischium with 3 or 4 short transverse, tuberculate ridges and long setae, frequently small spine at

ventrolateral distal angle. Coxa sometimes with spine at ventromesial distal angle.

Ambulatory legs (Figs. 2D, E) overreaching right cheliped by 0.50–0.75 length of dactyls. Dactyls long and slender, 1.25–1.75 length of propodi; in dorsal view, distal 0.35 distinctly twisted; in lateral view, distal 0.35 strongly curved ventrally; each terminating in small corneous claw; dorsal surfaces each with row of low protuberances, increasing in strength distally and accompanied by long stiff setae; mesial faces each with row of long stiff setae ventrally, rather widely-spaced in proximal 0.65, but becoming closely-spaced distally; lateral faces each with few sparse tufts of setae, most abundant on left third; ventral margins unarmed. Propodi 0.25–0.40 longer than carpi; dorsal surfaces each with double row of short transverse ridges extending onto lateral faces and set with moderately long stiff setae, lateral face of left third usually with more numerous tufts of setae; mesial and ventral surfaces glabrous or with few scattered short setae. Carpi 0.65–0.90 length of meri; dorsal surfaces of second pereopods each with spine at distal angle and 1–6 additional spines, usually also 1–3 proximally on third right pereopod, all also with row of tufts of stiff setae; lateral faces each with 2 or 3 rows of short transverse ridges and short setae; ventral surfaces each with few setae on distal margin; mesial faces usually glabrous, occasionally with few scattered setae. Meri laterally compressed; dorsal surfaces each with row of transverse scute-like ridges and long stiff setae; lateral faces each with 1 or 2 longitudinal rows of short setae in ventral half; mesial faces glabrous or with very few sparse tufts of short setae; ventral surfaces of second pereopods each usually with 1–5 acute spines or with 1 or 2 spines distally and 3 or 4 blunt or spinulose protuberances proximally, accompanied by tufts of setae; third with only tufts of setae. Ischia each with few setae dorsally and ventrally. Anterior lobe of sternite of third pereopods (Fig. 1G) roundly subrectangular, with long setae on or adja-

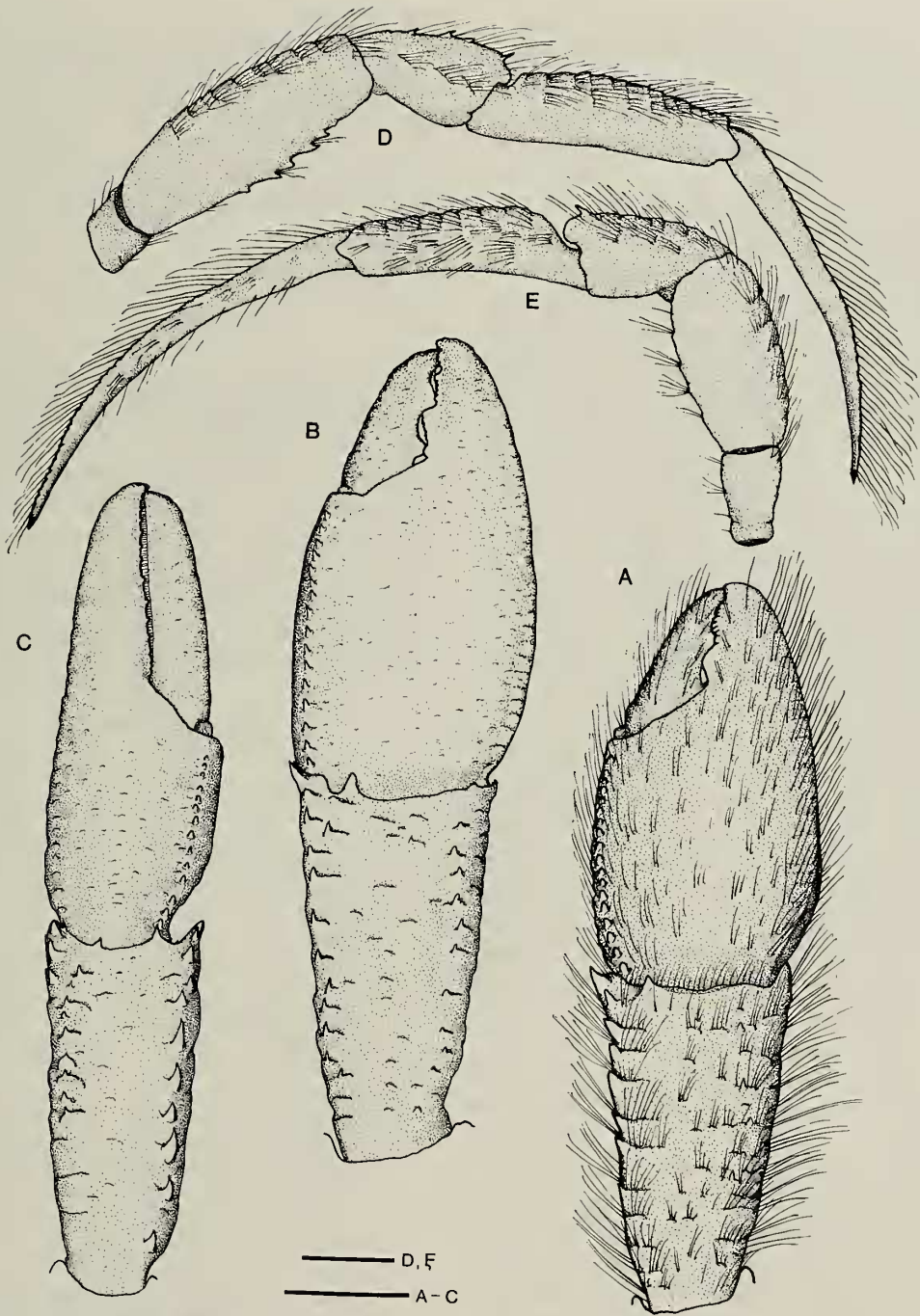


Fig. 2. *Nematopaguroides reconditus*, new species. A, male paratype from Stn. 6162, IOCAS N198B-8; B-E, male holotype, IOCAS L62B: A, carpus and chela of right cheliped (dorsal view, setae omitted); B, carpus and chela of right cheliped (dorsal view, setae omitted); C, carpus and chela of left cheliped (dorsal view, setae omitted); D, right second pereopod (lateral view); E, left third pereopod (lateral view). Scales equal 2 mm.

cent to anterior margin. Fourth pereopods semichelate; dactyls long and slender, usually with prominent preungual process at base of claw; propodi with tufts of long setae dorsally and ventrolaterally; carpi with setose lateral faces.

Males with well developed, elongate sexual tube (Fig. 1H) produced from coxa of right fifth pereopod, stout in proximal 0.35–0.50, filiform distally, coxa of left fifth with short sexual tube, moderately stout proximally, shorter distal portion appreciably more slender but not filiform; unpaired left pleopods 3–5 unequally biramous, fifth with external ramus appreciably longer and more setose than third and fourth. Females with moderately short, but quite dense setae anteriorly on sternite and right coxa of fifth pereopods; egg-bearing pleopods 2–4 with both rami approximately of equal length, non egg-bearing fifth pleopod with considerably longer, more setiferous external ramus, rudimentary internal ramus.

Telson (Fig. 1I) with distinct transverse indentations; anterior often nearly twice length of posterior lobes; posterior lobes symmetrical or nearly so, subtriangular, separated by broad median cleft; terminal margins oblique, each with 2–4 small spines and usually 1 much more prominent spine at apex; lateral margins slightly rounded, each with row of 4–7 moderately short bristles.

Color.—Not known.

Habitat.—Mud and sand substrates, 145–220 m; occupying variety of gastropod shells.

Etymology.—From the Latin *reconditus* meaning concealed, and referring to the superficial similarity of this taxon to species of *Nematopagurus*, which undoubtedly has caused it to be overlooked in the past.

Distribution.—At present recognized only from the Hainan Island area of the South China Sea.

Remarks.—The distinctive male sexual tubes and lack of female modified and paired first pleopods will immediately distinguish *Nematopaguroides reconditus*

from species of *Nematopagurus*. However, the general similarity of the armature and setation of the chelipeds of the new species may easily lead the casual observer to confuse it with those species of *Nematopagurus* that resemble *N. gardineri* Alcock, 1905, *N. meiringae* McLaughlin, 1998, and particularly *N. kosiensis* McLaughlin, 1998.

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